DOCUMENT RESUME

ED 296 551 EC 210 320

AUTHOR Nasca, Donald
TITLE The Use of Non-Verbal Measures of Intellectual Functioning in Identifying Gifted Children.
PUB DATE 17 Mar 88
NOTE 12p.
PUB TYPE Reports - Evaluative/Feasibility (142) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Ability Identification; *Aptitude Tests; Cognitive Measurement; Comparative Analysis; Diagnostic Tests; Elementary Education; *Gifted; *Intelligence Tests; *Nonverbal Tests; *Test Bias; Test Interpretation; Verbal Tests
IDENTIFIERS Otis Lennon Mental Ability Test; Raven Progressive Matrices; Slosson Intelligence Test; Test of Nonverbal Intelligence; Wechsler Intelligence Scale for Children (Revised)

ABSTRACT

Concern about the possible bias of using only verbal assessments for the identification of intellectually gifted students led to an examination of the effect of incorporating nonverbal assessments of intelligence into the identification process. Two nonverbal instruments (Progressive Matrices and Test of Nonverbal Intelligence) were used in conjunction with three more traditional, verbally oriented measures (Slosson, Otis-Lennon, and Wechsler Intelligence Scale for Children-Revised--WISC-R) in three separate populations of elementary-level students. One study focused on use of the Progressive Matrices in conjunction with the Slosson, the second compared the Test of Nonverbal Intelligence with the Slosson, and the third examined relationships between the Progressive Matrices and the WISC-R and Otis-Lennon. Results demonstrated that correlations among all pairs of measures of intellectual functioning were generally low. The addition of a nonverbal measure to the identification process influenced between 6.9% and 28.6% of the giftedness assessments. Variability was a function of the particular combination of instruments used, the grade level at which identification occurred, and the way scores were used in decision-making. (Author/JDD)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED296551

The use of Non-Verbal Measures of Intellectual Functioning in Identifying Gifted Children.

March 17, 1988

Donald Nasca, Ed. D.

Professor of Educational Administration
State University College at Brockport
Brockport, New York 14420

ABSTRACT

Concern about the possible bias of using only verbal assessments for the identification of intellectually gifted students led to an examination of the effect of incorporating non-verbal assessments of intellegence into the identification process. Two non-verbal instruments (Progressive Matrices and Test of Nonverbal Intelligence) were used in conjunction with three more, traditional, verbally oriented measures (Slosson, Otis-Lennon, and WISC-R) in thre separate studies of elementary level students. Results demonstrated that the addition of a non-verbal measure to the identification process could influence betwen 8.8% and 67% of the decisions to identify students as intellectually gifted. Variability was a function of the particular combination of instruments used and the grade level at which idenification was occurring.

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Donald Nasca

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

EC 210320

A COMPARISON OF THE EFFECT OF TWO NON-VERBAL MEASURES OF INTELLECTUAL FUNCTIONING ON IDENTIFICATION OF INTELLECTUALLY GIFTED STUDENTS

The use of multiple criteria for identifying gifted youth has taken on two substantially different interpretations. One group of 'multiple criteria' proponents uses a wide variety of instruments including achievement measures, I.Q. tests, measures of creativity, leadership, motivation, etc. based on the conviction that giftedness is a multifaceted attribute. This generalist approach to giftedness uses a variety of identification criteria to insure that a range of attributes is considered in selecting a population to be served by differentiated programming. An alternative interpretation is the use of multiple criteria for the assessment of one particular type of giftedness. These later strategists have attempted to locate multiple techniques for measuring the same attribute in a belief that any single measure, administered on any single date, may adversely affect the decisions about the identification of gifted students. Hence, the current emphasis on non-verbal measures of intellectual functioning to supplement more traditionlly applied group and individualized tests of I.Q..

The purpose of this investigation was to assess the result of using multiple measures of intellectually functioning on final decisions regarding the identification of intellectually gifted children. Particulary, the effect of using a non-verbal measure of intellectually functioning to supplement more traditional measures of I.Q..

The traditional measures included in the investigations are the WISC-R, Slosson, and Otis-Lennon.

Two non-verbal measures of intellectually functioning were included in this investigation; the, TEST OF NON-VERBAL INTELLIGENCE (TONI), and the Raven's, PROGRESSIVE MATRICES (PM). Both tests require inductive reasoning grounded in geometric and figural relationships. That is, the student is presented with a set of figures that have some degree of relationship and are then asked to conclude which of several alternative figures best illustrates a continuation of that relationship. The basic task on both instruments has been described as a concept formation task and is similar to non-verbal analogies and non-verbal series extrapolation.

The PM has been in use since 1952 and has voluminous research support for its use as a measure of non-verbal concept formation. The PM is available for young children as the Colored Progressive Matrices (CPM) and for older subjects (7 and 8 year old and up) as the Standard Progressive Matrices (SPM). A continuous scale of percentile scores provides for continuity between the CPM and the SPM. Numerous studies included in the administration manual report reliabilities from .61 to .98 for 5 to 12 year old populations. Lower reliabilities more often occur with very young subjects. Reliabilities between .90 and .98 are the general rule for normal samples above 7 years of age. Construct,

content, and predictive validity studies demonstrate substantial correlation with related performance and non-verbal measures of intellectual functioning and moderate relationships with existing verbal measures.

The CPM is generally administered individually to children below the age of 8. Older children may be tested in small groups of five or six.

The TONI produces a TONI Quotient based on a mean of 100 and standard deviation of 15 (similar to a procedure used by the WISC-R). Reliability estimates reported in the technical manual are between .80 and .96 for children above 13 years of age. Young children (ages 6-7) have generated lower reliabilities (.78). This test is a language free measure more strongly related to intelligence than to either verbal measures or achievement. The strongest evidence for the test's validity comes from studies in which the test successfully discriminates among groups of subjects known to differ on general intelligence.

The TONI is primarily an individualized test requiring about 15 minutes to administer. It may be administered by an experienced or trained examiner to small groups of 3 to 5 students with no loss of accuracy or stability.

Three separate studies are included in this current investigation. All three studies involve the use of multiple criteria in selecting intellectually gifted students. The first focuses on use of the PM in conjunction with the Slosson, the second compares the TONI with the Slosson while the third examines relationships between the PM and the WISC-R and Otis-Lennon.

STUDY 1: PM and Slosson.

All students from three elementary (K-6) buildings in a rural, suburban district were screened for intellectual giftedness in a two stage process. Students with any degree of intellectual potential based on teacher or parent nomination and/or group test performance were identified. All of these students were then administered both the Slosson and either the CPM or SPM. All testing was done by elementary supervisors who were experienced in administering the Slosson and who carefully followed the direction manual for the PM. All testing was done in late spring.

A statistical summary of data collected by the two instruments is presented in Table 1. The moderately low correlation across grade levels and across the CPM and the SPM is relatively consistant. These correlations are lower than those generally reported in the literature. The population investigated in this study is however, unique, that is, only students with a potential for intellectual giftedness. Percentile conversion tables presented in the administration manual for example, placed a very large percentage of these students at the 90th and 95th percentile. It was necessary

therefore, to use raw scores to gain any degree of discrimination for purposes of selection. Based on this experience, new percentile conversions for high I.Q. samples were created. (The conversion table resulting from this process is appended.)

TABLE 1

MEANS, STANDARD DEVIATIONS, AND CORRELATION COEFFECIENTS FOR THE SLOSSON AND THE PM

GRADE	NUMBER	SLOSSON		PM		CORRELATION
		MEAN	SD	MEAN	SD	r
K	40	137.2	11.1	20.4	3.9	.47
1	46	128.6	8.9	23.7	5.1	.24
2	43	129.2	14.4	27.1	4.1	.26
3	54	126.9	10.4	31.6	3.1	.46
4	58	128.3	12.3	32.7	2.0	.21
5	57	132.8	11.8	43.1	7.3	.26
6	51	135.1	12.6	47.3	4.1	.35
					Mean r =	.32

Table 2 presents the results of a cross-tabulation analysis in which the frequency of high scores on one I.Q. measure are associated with low scores on the other measure. High scores are defined as 1SD above the mean while low scores are 1SD below the mean and between the mean and 1SD below the mean. The intent of this analysis is to find the number of individuals that might either be selected or de-selected as a result of using a second, non-verbal measure of intellectual functioning. Table 2, for example, demonstrates that a total of six (1.7%) high I.Q. students (as determined by the Slosson) would have some probability of being eleminated from consideration as gifted because of their relatively low non-verbal performance (-1SD on the PM). An additional eight (2.3%) high I.Q. students (again as defined by the Slosson) would be threatened with a lower probability of exclusion from the gifted category (scores between the mean and -1SD on the PM).

On the other hand, two low Slosson I.Q. students would have significantly increased their chances of being identified as gifted by virtue of their high (+1SD) non-verbal performance and an additional eight moderately low Slosson I.Q. students would have increased their chances of being identified as gifted as a function of their high

non-verbal performance.

TABLE 2

NUMBERS OF STUDENTS HIGH ON ONE TEST OF INTELLECTUAL FUNCTIONING AND LOW ON A SECOND TEST

GRADE	NUMBER	+ 1SD SLOSSON -1SD P M	MEAN TO -1SD PM	+ 1SD PM -1SD SLOSSON	MEAN TO -1SD SLOSSON
K	40	0	1	0	0
1	46	2	0	1	1
2	43	1	2	0	0
3	54	0	0	0	1
4	58	0	1	0	3
5	57	2	0	0	2
6	51	1	4	1	1
TOTAL	349	6	8	2	8
		1.7%	2.3%	.6%	2.3%
		4.0%		2.9%	

A total of 6.9% of the population initially identified as potentially gifted were reexamined as a result of adding a non-verbal measure of intellectual functioning to the final screening process.

STUDY 2: TONI and Slosson

Study 2 was completed in the same district during the following year. This study was completed on a smaller sample because all students in grades 1 through 6 had been screened and placed in cluster groups the previous year. All K students and new referrals in grades 1 through 6 are included in study 2. Tables 3 and 4 present the same analyses as Study 1. Table 3 presents a statistical summary of the testing data and results of the cross-tab analysis are presented in Table 4

Mean TONI quotients reported in Table 3 are considerably lower than mean Slosson quotients at every grade level. It will be recalled that all students identified as intellectually gifted during the previous year have been removed from the population in Study 2. Even though the Slosson grade level means are therefore lower than in Study 1, the TONI quotients are still out of proportion. There are no available comparisons in the literature to corroborate these results.

TABLE 3

MEANS, STANDARD DEVIATIONS, AND CORRELATION COEFFECIENTS FOR THE SLOSSON AND TONI.

GRADE	NUMBER	SLOSSON MEAN	SLOSSON SD	TONI MEAN	TONI SD	CORRELATION r
K	47	134.9	10.4	113.4	13.7	.21
1	47	128.1	10.1	105.5	12.1	.51
2	21	123.7	8.4	106.9	11.6	.17
3	23	122.7	9.5	101.8	13.3	.36
4	29	123.6	11.6	113.7	12.5	.13
5	25	125 6	12.6	113.9	13.8	.32
6	29	129.3	9.2	115.6	13.9	.22
					Mean r =	.27

A total of 11.3% of children (Table 4) in Study 2 were rexamined as a function of discrepencies between verbal and non-verbal measures of intellectual functioning. Nine of these children could have been eleminated from consideration as gifted while 17 might have been included in the gifted category solely as a function of their non-verbal performance.

TABLE 4

NUMBERS OF STUDENTS HIGH ON ONE TEST OF INTELLECTUAL FUNCTIONING AND LOW ON A SECOND TEST

GRADE	NUMBER	+ 1SD SLOSSON -1SD TONI	MEAN TO -1SD TONI	+ 1SD TONI - 1SD SLOSSON	MEAN TO -1SD SLOSSON
K	47	0	1	1	3
1	47	0	1	0	2
2	21	0	2	0	1
3	23	0	1	1	0
4	29	0	2	2	1
5	25	1	0	0	1
6	29	0	1	1	4
TOTAL	221	1	8	5	12
		.04%	3.6%	2.3%	5.4%
		3.6%		7.7%	

Study 3: PM and WISC-R and Otis-lennon

The third study was completed in another suburban rural district in which selection and placement of intellectualy gifted students has been occuring for four years. Selection of the intellectually gifted is again a two stage process in which the Otis-Lennon, along with several other sources, is used in preliminary screening. All students nominated for consideration are given the WISC-R. The PM was added to this final screening process during the spring of 1983. Only second grade students are included in this study.

Data similar to those analyzed in Studies 1 and 2 are reported in Tables 5, 6 and 7. A statistical summary in Table 5, a correlation matrix in table 6, and a cross-tab summary in Table 7.

TABLE 5

MEANS AND STANDARD DEVIATIONS FOR THE SECOND GRADE SAMPLE (N=28)

OTIS LENNON		WISC-R VERBAL		WISC-R PREFORMANCE		WISC-R TOTAL		PM	
MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
126.9	10.3	126.3	8.6	123.4	7.7	127.8	6.6	30.6	2.4

Correlations reported in Table 6, as in the previous two studies, are consistantly low. This can be a function of two factors. The unique populations being investigated and/or the relatively limited range of scores produced by subjects who are initially screened for intellectual giftedness.

TABLE 6

INTERCORRELATION MATRIX FOR THE SECOND GRADE SAMPLE (N=28)

	OTIS LENNON	WISC-R VERBAL	WISC-R PREFORMANCE	WISC-R TOTAL	PM
OTIS-LENNON	1.00	.32	.11	.31	.00
WISC-R VERBAL		1.00	.06	.77	-.15
WISC-R PREFORMANCE			1.00	.68	-.20
WISC-R TOTAL				1.00	-.21

A total of 28.6% of second grade students (Table 7) were actually reexamined as a function of non-verbal performance substantially different from that obtained on the more traditionally used I.Q. measure. (18% would have been reexamined if the criterion measure had been the Otis-Lennon.

Although a much smaller sample and limited to only one grade level, Study three continues to support the notion that measures of non-verbal functioning will modify decisions in the final selection of intellectually gifted students.

TABLE 7

NUMBERS OF STUDENTS HIGH ON ONE TEST OF INTELLECTUAL FUNCTIONING AND LOW ON A SECOND TEST (N=28)

	+ 1SD WISC-R		+ 1SD PM	
	-1SD PM	MEAN TO -1SD PM	+1SD WISC-R	MEAN TO -1SD WISC-R
	1	2	2	3
	3.6%	7.2%	7.2%	10.7%
	10.8%		17.8%	

	+ 1SD OTIS LENNON		+ 1SD PM	
	-1SD PM	MEAN TO -1SD PM	-1SD OTIS	MEAN TO -1SD OTIS
	1	1	1	2
	3.6%	3.6%	3.6%	7.2%
	7.2%		10.8%	

SUMMARY OF FINDINGS

Three separate populations of elementary children were investigated to determine how measures of non-verbal intellectual functioning would influence decisions about the identification of students as intellectually gifted.

Correlations between all pairs of measures of intellectual functioning investigated in three studies were generally low, lower than correlations reported in technical manuals accompanying the tests. This may well be due to the unique nature of the populations, i.e. students who had been intitially screened as potentially gifted, or perhaps because of the narrow range of scores generated by these high ability subjects. Regression toward the mean does not appear to a relevant issue.

The total number of students potentially affected by the addition of a non-verbal measure of intellectually functioning during the identification process varied in the three studies from 6.9% to 28.6%.

CONCLUSIONS

The addition of a non-verbal measure of intellectual functioning to more traditionally used measures of I.Q. during the identification process will influence decisions about the inclusion of students in intellectually gifted populations. The extent of this influence will

depend on two primary factors, the particular combination of instruments used and the way scores are used in decision making. One may reexamine data presented in the three studies to determine the impact of various decision making strategies, eg. miniumn cut-off scores, % of the population based on weighted scores, minimun score on any one measure, etc.

A third major factor to be considered in using non-verbal measures of intellecatual functioning is the nature of differentiated instruction being provided for students who are identified as intellectually gifted. That is, is the program of differentiated instruction primarily verbal, primarily non-verbal, oriented toward higher cognitive level thinking, dependent upon learned language skills, focused on accelerated content, etc.

Specific recommendations on the use of non-verbal measures of intellectual functioning will become available only after the predicative validity of indentification criteria has been established. This can occur when specific identification criteria have been correlated with specific outcome measures used in conjunction with well defined programs of differentiated instruction. Until such time as these specifics are available, only qualified generalizations are available.

REFERENCES

Raven, J.C., Court, J.H., and Raven, J. (1977). Manual for Raven's progressive matrices and vocabulary scales. London: H.K. Lewis and Co.

Brown, L., Sherbenou, R.J., and Dollar, S.J. (1982) Test of nonverbal intellegence: a language free measure of cognitive ability (TONI). Texas: Pro-Ed

APPENDIX

SCREENING GIFTED STUDENTS USING THE "PROGRESSIVE MATRICES"

Progressive Matrices and Slosson I.Q. Scores for a Sample of K-6 Gifted Students

Grade	Progressive Matrices				Slosson I.Q.	r
	N	X	S.D.	Range	X	
K	50	21	4.5	17-31	136	.35
1	36	24	4.8	20-34	130	.34
2	50	28	4.4	18-34	126	.42
3	59	32	2.6	26-38	132	.35
4	39	39	4.6	30-47	129	.56
5	59	47	4.0	37-53	135	.40
6	54	51	5.1	39-57	130	.76

Ammended Progressive Matrices Norms for Gifted Students

	Colored			Advanced			
Grade	K	1	2	3	4	5	6
%							
95	30	32	34	38	45	53	58
90	29						
85	28	31	33	37	44	52	57
80	27	30					
75	26	29	32	36	43	51	56
70	25	28					
65	24	27	31	35	42	50	55
60	23	26	30	34	41	49	54
55	22	25	29	33	40	48	53
50	21	24	28	32	39	47	51
40	19	22	26	30	37	45	49
30	17	20	24	28	35	43	47
20	16	18	20	26	30	38	42